Energy and Products from Renewable Domestic Resources

Enhancing Our Nation's Energy Security and Environment

Advances in plant science and process technologies promise to revolutionize the production of energy and products from biomass–the organic material provided by crops, trees, agricultural and forestry residues, and animal waste. Like fossil fuels, the energy in biomass comes from carbon, yet biomass is a renewable resource that is virtually inexhaustible and cleaner for the environment when managed correctly.

In his State of the Union address in January 2006, President Bush outlined his Biofuels Initiative. This endeavor aims to accelerate research and development of bio-based fuels that can supplement (and thus reduce) our use of petroleum.

The U.S. Department of Energy's Biomass Program supports the Administration's goal of increasing America's use of biofuels, making them available and cost effective to reduce dependence on foreign oil. A greater role for biomass will enhance our energy security, provide for a cleaner environment and stimulate economic growth.

The Biomass Program develops technology for conversion of biomass (plant-derived material) to fuels, chemicals, materials and power. Biomass is one of our most important energy resources:

- As of 2004, biomass provides 47% of all renewable energy.
- Renewable energy accounts for six percent of all energy generated and consumed in the United States.

Biomass provides the only renewable alternative for liquid transportation fuel. The best-known of these is ethanol:

- Made primarily from corn, ethanol is often sold as a blend with petroleum;

E85 for instance contains 85 percent ethanol to 15 percent gasoline.

- The ethanol market has the potential to grow to *16 billion gallons* per year.

Research Focus

The Biomass Program partners with U.S. industry to foster research and development. The Program's two primary goals are (1) reduce dependence on foreign oil by developing liquid fuels and (2) create biorefineries that economically co-produce fuel, power, and products.

The Program supports research and development on a variety of subjects:

- **Feedstock research** explores the qualities and quantities of crops and organic residue (such as agricultural and forestry residue) and their suitability for conversion to biomass-generated energy and bioproducts.
- Platforms (technology strategies) for harnessing biomass, specifically the biochemical platform and the thermochemical platform.

  a) The **biochemical platform** looks at ways in which cellulose and hemi-cellulose can be broken down into their component sugars, for easier conversion into fuels and bioproducts.

  b) The **thermochemical platform** looks at ways to use cellulosic (i.e., wood-based) substances, through conversion into liquid or gas, and how these converted substances may be further changed into useful bioproducts.

The Program also works to develop **biorefineries:**

- Like petrochemical refineries, these industrial complexes turn quantities of organic byproducts into fuels and bioproducts.
- One goal of biorefinery R&D is to discover replacements for petrochemicals in modern household products.

The Program relies on competitive solicitations to identify projects that support the program focus areas, and then funds projects in partnership with the private sector, national laboratories and universities.

Raising Awareness, Describing Success

The Program also publicizes research results to industry and educates consumers on the benefits of biomass.

Successes in biomass research include:

- Fractionation of corn fiber and conversion to high-value chemicals.
- Operation of small, modular biomass gasifiers to produce electricity in rural areas.
- Development of a bark-based natural resin, used in manufacturing plywood and stand board.
- Operation of the first full-scale gasification system in the pulp and paper industry.

Biomass Today

- Current biomass electric generating capacity is about 12,300 MW, enough to meet the power needs of Massachusetts.
- In 2001, production of fuel ethanol reached 1.76 billion gallons and production of biodiesel equaled 20 million gallons.
- Current production of biobased textile fibers, polymers, adhesives, lubricants, adhesives, soy-based inks, and other products is estimated at 12.4 billion pounds per year.

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

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